

IMPACT PERFORMANCE OF KEVLAR FABRICS WITH SHEAR THICKENING FLUID

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Abstract

In modern day warfare, flexible and light weight body armor, which can provide protection to all the parts of body against all kinds of shrapnel and bullets, is required. The best suited material for its application is Kevlar based bullet proof vest and wearable. However situation requires lesser number of Kevlar layers to make the protective layer which will be extremely light and provide flexibility of motion. To achieve this, a non-Newtonian fluid known as Shear Thickening Fluid (STF) is developed, optimum value is obtained for Kevlar-STF combination and the layers of Kevlar are impregnated with STF. Samples of 4, 6 and 8 layers of Kevlar fabrics are bonded together at the edges by epoxy resin and are subjected to impact loading for different speeds. Experiments are conducted till the ballistic limits of the samples and the ballistic limit values are obtained. The energy absorbed, residual velocities and the ballistic limits of the sample are calculated and compared with theoretically calculated values. Experiments are carried for fabrics with and without STF. It is found that there is a substantial increase in the energy absorption of Kevlar with the addition of STF and the study reveals that the STF based impact resistant structures can be better structural armor material with less number of layers and less weight.

Keywords: Shear Thickening Fluid, Kevlar Bullet Proof Vest, Impact Absorption, Armor Application